

Amendments to the Claims

This listing of claims will replace all prior versions, and listing, of claims in the application.

Listing of Claims:

1. (~~Currently Amended~~Original) A solid-state imaging device, comprising:

at least one pixel section; and

a control section for controlling an operation of the at least one pixel section;

~~wherein:~~

wherein the at least one pixel section includes:

a light receiving section for outputting charges by performing photo-electric conversion of light incident thereon, and

a transistor section having a charge accumulation region for accumulating the charges output by the light receiving ~~section; section, where~~ the transistor section outputs an output signal representing a voltage value corresponding to an amount of charges accumulated in the charge accumulation region; and

wherein the control section controls the resetting operation of the at least one pixel section, for resetting the charges accumulated in the charge accumulation region after the output signal is output from the transistor section, including causing injects charges to be injected into the charge accumulation region before discharging the accumulated charges from the charge accumulation region.

2. (~~Currently Amended~~Original) A solid-state imaging device according to claim 1, further comprising a substrate, wherein:

the transistor section further includes a gate electrode, a source electrode, and a drain electrode; and

the control section ~~causes injects the charges to be injected~~ into the charge accumulation region from the substrate by applying a first gate voltage to the gate electrode.

3. (~~Currently Amended~~Original) A solid-state imaging device according to claim 2, wherein:

the control section ~~controls the resetting operation of the at least one pixel section including discharges the accumulated controlling discharging of~~ charges from the charge accumulation region after ~~said injecting charges therein and such that a prescribed amount of charges remain in the charge accumulation region following the discharging operation.~~ by applying a second gate voltage to the gate electrode, and

~~the second gate voltage has a value which causes a prescribed amount of charges to remain in the charge accumulation region.~~

4. (~~Currently Amended~~Original) A solid-state imaging device according to claim 2, wherein the control section ~~controls a charge accumulating operation of the at least one pixel section for accumulating~~ accumulates the charges output from the light receiving section in the

charge accumulation region by ~~causing applying~~ a third gate voltage to ~~be applied to~~ the gate electrode.

5. (~~Currently Amended~~Original) A solid-state imaging device according to claim 2, wherein the control section ~~controls outputting of outputs~~ the output signal from the transistor section by ~~causing a applying~~ a fourth gate voltage to ~~be applied to~~ the gate electrode.

6. (~~Currently Amended~~Original) A solid-state imaging device according to claim 4, wherein ~~the first gate voltage being applied to the gate electrode is set so~~ a value of a potential barrier between the substrate and the charge accumulation region ~~when the first gate voltage is applied to the gate electrode is~~ smaller than a value of the potential barrier between the substrate and the charge accumulation region when the third gate voltage is applied to the gate electrode.

7. (~~Currently Amended~~Original) A solid-state imaging device according to ~~claim 3~~claim 16, wherein ~~a value of~~ the second gate voltage is obtained by shifting a gate voltage value necessary to completely discharge the charges accumulated in the charge accumulation region in a direction causing the prescribed amount of charges to remain in the charge accumulation region.

8. (Original) A solid-state imaging device according to claim 1, including a plurality of pixel sections which are arranged in a matrix.

9. (~~Currently Amended~~Original) A solid-state imaging device according to claim 4, ~~further~~ including a plurality of pixel sections, wherein:

the control section ~~causes~~ ~~applies~~ the third gate voltage to ~~be applied to~~ a gate electrode included in at least one unselected pixel section among the plurality of pixel sections, and

~~where a value of the third gate voltage be applied is set so as to prevent~~ prevents charges from being injected from the substrate into the charge accumulation region.

10. (Original) A solid-state imaging device according to claim 1, wherein:

the at least one pixel section further includes a substrate including a well region;

the transistor section includes:

an annular gate electrode,

a source electrode surrounded by the gate electrode,

a drain electrode surrounding the gate electrode, and

a channel region provided at a position which is in the well region and below the gate electrode;

the charge accumulation region is provided at a position which is in the well region and below the channel region, so as to surround the source electrode, and

the transistor section is connected to the light receiving section via the well region.

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16. (New) A solid-state imaging device according to claim 3, wherein the control section controls discharging of charges from the charge accumulation region by causing a second gate voltage to be applied to the gate electrode, where the second gate voltage is set so that following said discharging of charges the prescribed amount of charges remains in the charge accumulation region.

17. (New) A solid-state imaging device according to claim 3, wherein the charges being injected into the charge accumulation region are not charges from the photo-electric conversion process performed in the light receiving section.

18. (New) A solid-state imaging device, comprising:

at least one pixel section;

a control section for controlling operation of the at least one pixel section;

wherein the at least one pixel section includes:

a light receiving section for outputting charges by performing photo-electric conversion of light incident thereon, and

a transistor section having a charge accumulation region for accumulating the charges output by the light receiving section, where the transistor section outputs an output signal representing a voltage value corresponding to an amount of charges accumulated in the charge accumulation region; and

wherein the control section is arranged to control the resetting operation of the at least one pixel section for resetting the charges accumulated in the charge accumulation region after the output signal is output from the transistor section,

wherein said controlling of the resetting operation includes controlling a charge injection operation and a charge discharging operation, where charges unrelated to the photo-electric conversion process are injected into the charge accumulation region in the charge injection operation before the discharging operation and in the discharging operation charges are discharged from the charge accumulation region such that a prescribed amount of charges remain in the charge accumulation region following the discharging operation.

19. (New) A solid-state imaging device according to claim 18, further including a substrate and wherein:

the transistor section further includes a gate electrode; and

the control section is arranged to control operation of the at least one pixel section by controlling voltage(s) being applied to the gate electrode.

20. (New) A solid-state imaging device according to claim 19, wherein the control section controls the voltage(s) being applied to the gate electrode during the charge injection operation so that a first gate voltage is applied to the gate electrode, the first gate voltage having a value set so that charges are injected into the charge accumulation region from the substrate.

21. (New) A solid-state imaging device according to claim 19, wherein the control section controls the voltage(s) being applied to the gate electrode during the charge discharging operation so that a second gate voltage is applied to the gate electrode, the second gate voltage having a value set so that the prescribed amount of charges remain in the charge accumulation region following the discharging operation.

22. (New) A solid-state imaging device according to claim 21, wherein the value of the second gate voltage is obtained by shifting a gate voltage value necessary to completely discharge the charges accumulated in the charge accumulation region in a direction that causes the prescribed amount of charges to remain in the charge accumulation region.

23. (New) A solid-state imaging device according to claim 19, wherein the control section controls the voltage(s) being applied to the gate electrode during a charge accumulation operation, during which charges output from the light receiving section are accumulated in the

charge accumulation region, so that a third gate voltage is applied to the gate electrode so that charges are injected into the charge accumulation region from the substrate.

24. (New) A solid-state imaging device according to claim 23, wherein the first gate voltage being applied to the gate electrode is set so a value of a potential barrier between the substrate and the charge accumulation region is smaller than a value of the potential barrier between the substrate and the charge accumulation region when the third gate voltage is applied to the gate electrode.

25. (New) A solid-state imaging device according to claim 23, wherein a value of the third gate voltage is set so the voltage(s) being applied is such as to prevent charges from being injected from the substrate into the charge accumulation region during the charge accumulation operation.

26. (New) A solid-state imaging device according to claim 19, wherein the control section controls the voltage(s) being applied to the gate electrode during a signal outputting operation, during which a signal is output from the transistor section, so that a fourth gate voltage is applied to the gate electrode.

27. (New) A solid-state imaging device according to claim 18 comprising a plurality of pixel sections that are arranged in a matrix.

28. (New) A solid-state imaging device, comprising:

a substrate;

at least one pixel section;

wherein the at least one pixel section includes:

a light receiving section for outputting charges by performing photo-electric conversion of light incident thereon, and

a transistor section having a charge accumulation region for accumulating the charges output by the light receiving section and a gate electrode, where the transistor section outputs an output signal representing a voltage value corresponding to an amount of charges accumulated in the charge accumulation region; and

a control section arranged for controlling operation of the at least one pixel section by controlling voltage(s) being applied to the gate electrode

wherein the control section is arranged to control the resetting operation including a charge injection operation and a charge discharging operation, of the at least one pixel section for resetting the charges accumulated in the charge accumulation region after the output signal is output from the transistor section,

wherein the control section controls the voltage(s) being applied to the gate electrode during the charge injection operation so that a first gate voltage is applied to the gate electrode before the charge discharging operation, the first gate voltage having a value set so that charges are injected into the charge accumulation region from the substrate; and

wherein the control section controls the voltage(s) being applied to the gate electrode during the charge discharging operation so that a second gate voltage is applied to the gate electrode, the second gate voltage having a value set so that a prescribed amount of charges remain in the charge accumulation region following the discharging operation.

29. (New) A solid-state imaging device according to claim 28, wherein the charges being injected into the charge accumulation region are not charges from the photo-electric conversion process performed in the light receiving section.

30. (New) A solid-state imaging device according to claim 28, wherein the control section controls the voltage(s) being applied to the gate electrode during a charge accumulation operation, during which charges output from the light receiving section are accumulated in the charge accumulation region, so that a third gate voltage is applied to the gate electrode so that charges are injected into the charge accumulation region from the substrate.

31. (New) A solid-state imaging device according to claim 30, wherein the first gate voltage being applied to the gate electrode is set so a value of a potential barrier between the substrate and the charge accumulation region is smaller than a value of the potential barrier between the substrate and the charge accumulation region when the third gate voltage is applied to the gate electrode.

32. (New) A solid-state imaging device according to claim 30, wherein a value of the third gate voltage is set so the voltage(s) being applied is such as to prevent charges from being injected from the substrate into the charge accumulation region during the charge accumulation operation.

33. (New) A solid-state imaging device according to claim 28, wherein the control section controls the voltage(s) being applied to the gate electrode during a signal outputting operation, during which a signal is output from the transistor section, so that a fourth gate voltage is applied to the gate electrode.

34. (New) A solid-state imaging device according to claim 28 comprising a plurality of pixel sections that are arranged in a matrix.